

**Citation:**

Maffeis C, Talamini G, Tato L. Influence of diet, physical activity and parents' obesity on children's adiposity: A four-year longitudinal study. *Int J Obes*. 1998; 22: 758-764.

**PubMed ID:** [9725635](#)

**Study Design:**

Prospective Cohort Study

**Class:**

B - [Click here](#) for explanation of classification scheme.

**Research Design and Implementation Rating:**

POSITIVE: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

To investigate the relationship between diet, physical activity level, parents' obesity at baseline and subsequent fat gain in a group of pre-pubertal Italian children over a four-year period.

**Inclusion Criteria:**

Caucasian, Italian children attending public and private schools in Italy, approximately eight years of age at baseline.

**Exclusion Criteria:**

Health problems other than obesity.

**Description of Study Protocol:****Baseline**

- Children and their parents had a diet history interview with the dietitian
- The dietitian filled out a questionnaire on socio-economic status of the family and the physical activity level of the child
- Weight and height of the parents were recorded
- Height, weight and skinfold thickness measurements of the children were obtained by a pediatrician
- Physical examination (for health problems other than obesity).

**Four Years Later**

- Each family was invited by letter for a second visit to the project laboratory at the hospital
- Height and weight measurements were taken by the pediatrician for each child.

## Data Collection Summary:

### Measures

- *Relative BMI*: (BMI at 50th percentile for age and gender) x 100 – BMI tables based on Rolland-Cachera 1982 (measured height and weight following standardized procedures)
- *Obesity*: Defined as relative BMI greater than 120%
- *Child's dietary intake*: Energy intake, percent of energy intake as fat, percent of energy intake as protein, percent of energy intake as carbohydrate (diet history obtained through interview with mothers and children)
- *Child's physical activity*: Amount of sleep, sports and programmed exercise performed in a week, time spent daily watching TV, time spent daily at school, and kind and duration of games played (questionnaire).

### Statistical Analysis

- T-tests or Wilcoxon test to compare anthropometric data and dietary variables of the children at baseline and four years later, and between the obese and non-obese children; Bonferroni correction for multiple tests
- Multiple regression analysis:
  - *Dependent variable*: Relative BMI at baseline and follow-up
  - *Independent variables*: Age, gender, energy intake, percent of energy intake as fat, percent of energy intake as protein, percent of energy intake as carbohydrate, parents' BMI, TV viewing time and time spent on vigorous activity)
- Repeated measures model:
  - *Dependent variables*: Relative BMI at baseline and follow-up
  - *Covariates*: Age, gender, parents' BMI, energy and nutrient intake, TV viewing time and time spent on vigorous activity)
- Logistic regression analysis of the ability of the variables at baseline to predict relative BMI at follow-up
- Multiple regression analysis two:
  - *Dependent variable*: Changes in relative BMI
  - *Covariates*: Age, gender, energy intake, percent of energy intake as fat, percent of energy intake as protein, percent of energy intake as carbohydrate, parents' BMI, TV viewing time time spent on vigorous activity.

## Description of Actual Data Sample:

### Initial N

298 pre-pubertal Caucasian children (148 male, 150 females) aged 8.7±1.1 years.

### Withdrawals/Drop-Outs

186 subjects:

- Unable to contact 67 families because of changes in address and telephone number

- 88 families refused to participate in the follow-up because of simultaneous participation in other prevention screening programs
- 31 families confirmed but were not able to get to project laboratory.

### **Final N**

112 Caucasian, Italian children.

### **Race/Ethnicity**

Caucasian

### **Age**

8.7±1.1 years at baseline and 12.3±1.0 at follow-up.

### **Location**

Italy.

## **Summary of Results:**

### **Cross-sectional Analyses at Baseline**

- No significant differences for age, gender, puberty stage, relative BMI, energy intake and diet composition and parents' BMI at baseline were found between Group A (children who participated in follow-up) and Group B (children who did not participate in follow-up)
- Total sample obesity was 24.8% (21.0% for males, 28.7% for females)
- Girls had higher adiposity than boys ( $P<0.001$ ).
- Boys had a higher energy intake than females ( $2,030\pm333$  vs.  $1,888\pm296$  kcal per day,  $P<0.001$ )
- Boys had a higher carbohydrate percentage ( $57.6\pm5.3$  vs.  $56.4\pm4.5$ ) and lower fat intake percentage than girls ( $P<0.05$ )
- BMIs of obese children's mothers ( $24.3\pm3.4$ ) were significantly higher than those of non-obese children's mothers ( $21.7\pm3.0$ ),  $P<0.0001$
- Energy intake and diet composition were not significantly different in obese and non-obese children
- Obese children spent more time watching TV than non-obese children ( $96\pm24$  vs.  $79\pm27$  minutes per day,  $P<0.05$ ) and less time performing vigorous activity ( $176\pm66$  vs.  $199\pm52$  minutes per week,  $P<0.05$ )
- Relative BMI correlated to TV Watching time ( $R=0.27$ ,  $P<0.001$ ) and inversely correlated to time spent on vigorous activity ( $R=-0.19$ ,  $P<0.05$ ).

### **Multivariate Analyses**

Multiple regression analysis revealed that mothers' BMI and TV viewing accounted for 17% of the children's relative BMI variance at eight years of age ( $R=0.42$ ,  $P<0.001$ ). Other variables were rejected.

### **Longitudinal Analyses**

- Relative BMI at follow-up was not different than relative BMI at baseline; they were

significantly related ( $R=0.73$ ,  $P<0.001$ )

- Eight out of 25 children who were obese at baseline were no longer obese at follow-up (three males, five females)
- Five non-obese children at baseline were obese at follow-up (two males, three females)
- Multiple regression analysis revealed the mothers' and fathers' BMIs were the only independent variables that accounted for 13.5% of the children's relative BMI variance at the age of 12 years ( $R=0.37$ ,  $P<0.001$ ). Other independent variables were rejected.
- Multivariate logistic regression analysis was performed on two groups of children, selected on the basis of a positive or negative change of their relative BMI between final and baseline measurements. Relative BMI at baseline was the only independent variable in the final equation.
- Multiple regression analysis using the changes in relative BMI did not find any significant relationships.

#### Author Conclusion:

- The parents' obesity was the main risk factor for obesity in this group of children, at age eight and 12 and with boys and girls
- Energy and nutrient intake is secondary to parents' obesity and child's inactivity
- Sedentary behavior (TV viewing) was independently associated with overweight at the age of eight years.

#### Reviewer Comments:

##### *Strengths*

- *Longitudinal nature of the study*
- *Height and weight were measured by the same two investigators*
- *Some statistical assumptions and corrections were accounted for in analyses.*

##### *Limitations*

- *Caucasian population*
- *Rate of subjects lost to follow-up was 186 out of 298, or 62.4%*
- *Self-reported diet history (obese are known to under-report).*

#### Research Design and Implementation Criteria Checklist: Primary Research

##### Relevance Questions

- |    |   |     |
|----|---|-----|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | N/A |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?   | Yes |

3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

### Validity Questions

<b>1.</b>	<b>Was the research question clearly stated?</b>	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
<b>2.</b>	<b>Was the selection of study subjects/patients free from bias?</b>	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
<b>3.</b>	<b>Were study groups comparable?</b>	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A

3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
<b>4.</b>	<b>Was method of handling withdrawals described?</b>	<b>Yes</b>
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
<b>5.</b>	<b>Was blinding used to prevent introduction of bias?</b>	<b>Yes</b>
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
<b>6.</b>	<b>Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?</b>	<b>Yes</b>
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A

6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
<b>7.</b>	<b>Were outcomes clearly defined and the measurements valid and reliable?</b>	<b>Yes</b>
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	No
7.7.	Were the measurements conducted consistently across groups?	Yes
<b>8.</b>	<b>Was the statistical analysis appropriate for the study design and type of outcome indicators?</b>	<b>Yes</b>
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
<b>9.</b>	<b>Are conclusions supported by results with biases and limitations taken into consideration?</b>	<b>Yes</b>
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	No
<b>10.</b>	<b>Is bias due to study's funding or sponsorship unlikely?</b>	<b>Yes</b>

10.1.	Were sources of funding and investigators' affiliations described?	No
10.2.	Was the study free from apparent conflict of interest?	Yes

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